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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during August, 1886, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i. Two hurricanes which passed over the Caribbean Sea and the Island of Cuba are also traced and described. In tracing the centres of the paths of these storms, data from the reports of one hundred and eighty-two vessels have been used.

On chart i for this month are traced the paths of fourteen areas of low pressure; the average number for August during the last thirteen years being only 9.5. The storm described as number viii was very destructive in eastern Texas on the 19th and 20th, doing great damage in Galveston, and completely destroying the town of Indianola. On this chart is also given a diagram showing the barometric conditions prevailing in the immediate vicinity of Indianola at 7 a. m. of the 20th, at which time the storm was central near that place.

The report by Prof. T. C. Mendenhall, Assistant, on the earthquake which occurred on the 31st of August in the eastern portion of the United States, is an interesting feature of this REVIEW. The report is based upon data collected from Signal Service observations, thunder-storm and tornado reports, and other sources. The reports from the regular Signal Service observers were specially valuable in determining the time of occurrence and intensity of the shock in different portions of the country. Chart number vii exhibits lines of equal intensity of the shock as determined from a careful examination of the data.

Chart number viii shows the atmospherical conditions, isobars, isotherms, and wind-directions accompanying the tornadoes in western New York on August 16th, at 3 p. m.

The drought in the central sections was broken on the 12th and 13th by the copious rainfalls accompanying the heavy thunder and wind storms that occurred in nearly all parts of the afflicted districts on those days.

The mean atmospheric pressure for the month is below the normal in nearly all parts of the country.

In all parts of the country lying east of the Mississippi River, and in Louisiana and eastern Texas, the mean temperature of the month is below the normal. From the Mississippi River westward to the Pacific Ocean the month has been warmer than the average August.

The precipitation is very unequally distributed, marked

departures, both above and below the normal, occurring at adjacent stations.

No icebergs were reported in, or to the southward of, the trans-Atlantic track after the 24th, and but few were encountered in, and to the eastward of, the Strait of Belle Isle and Newfoundland during the early portion of the month.

In the preparation of this REVIEW the following data, received up to September 20, 1886, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and twenty-two Canadian stations, as telegraphed to this office; one hundred and fifty-nine monthly journals; one hundred and fifty-three monthly means from the former, and twenty-two monthly means from the latter; two hundred and seventy-five monthly registers from voluntary observers; sixty-two monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Georgia, Indiana, Iowa, Missouri, Nebraska, New England, Ohio, and Tennessee; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The distribution of mean pressure for August, 1886, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The mean atmospheric pressure for the month is very equally distributed over the country. An area of comparatively high pressure extends over the Lake region, middle Atlantic states, south Atlantic states, northern Florida, east Gulf states, Tennessee and Ohio Valley; within the above districts the barometric means for the month vary from 29.95 at numerous stations to 30.01 at Nashville, Tennessee. Another area of high pressure extends along the north Pacific coast, within this area the mean pressure varies from 29.96 at Portland, Oregon, to 30.00 at Fort Canby, Washington Territory. The area of minimum pressure ranges from 29.80 to 29.85, and covers Nevada, western Utah, western Arizona, and eastern California. An area of low pressure, indicated by the isobar of 29.85, extends over the lower Saint Lawrence valley.

The departures, which are nowhere very great, are in almost every case below the normal. The mean pressure is above the normal for August at three stations only, viz., Fort Apache, Arizona, Deadwood, Dakota, and Cedar Keys, Florida, .02, .01, and .01, respectively. In the Lake region, New England, and the middle and south Atlantic states, the mean pressure for the month shows a deficiency of about .05, although at Sandy Hook and Atlantic City, New Jersey, the departures are .08 and .07, respectively. Along the Pacific coast the deficiencies range from .02 to .07. The largest departures occur in the Missouri Valley, where they vary from .06 to .09. Slight deficiencies occur over all other portions of the country, and vary from .01 to .08.

As compared with the mean pressure for the preceding month, July, 1886, an increase, varying from .01 to .09, occurs in all parts of the United States, except along the Pacific coast and in southern Florida, where a deficiency of .01 to .04 occurs.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the table of miscellaneous data. The greatest ranges occurred in New England, the middle Atlantic states, and in Montana, although, owing to the heavy storm of the 19th and 20th in southeastern Texas, a very large range occurred at San Antonio. Along the Pacific coast and in the southern districts the barometric ranges were generally small.

The following are some of the extreme monthly ranges:

Greatest.		Least.	
	<i>Inch.</i>		<i>Inch.</i>
San Antonio, Texas.....	1.41	Cape Mendocino, California.....	0.20
Mount Washington, New Hampshire.....	1.04	Red Bluff, California.....	0.25
Eastport, Maine.....	0.99	Sacramento, California.....	0.26
Portland, Maine.....	0.92	San Diego, California.....	0.27
Boston, Massachusetts.....	0.90	Fort Davis, Texas.....	0.28
Block Island, Rhode Island.....	0.84	Fort Sill, Indian Territory.....	0.28
New London, Connecticut.....	0.82	Frisco, Utah.....	0.29

AREAS OF HIGH PRESSURE.

[Prepared by Lieut. JNO. P. FINLEY, Signal Corps, U. S. Army, Assistant.]

Six areas of high pressure appeared within the limits of the United States during the month of August, 1886. With but two exceptions these areas made their first appearance north of 45° N., and between 107° and 112° W. The general direction of movement was invariably southeastward until the Atlantic coast was reached, when the direction changed to the east-northeast, skirting the coast.

Two areas first appeared north of Lake Superior, moving southeastward to central New York, and thence east-northeast, south of Nova Scotia.

Of all the areas described below, there is but one (number vi) of any special importance, rendered so by the low temperatures and heavy frosts which accompanied its progress over the upper Missouri valley and Minnesota. It may be said that with but two exceptions (areas numbers iv and vi) the month of August, 1886, was entirely devoid of high-pressure areas, yet, even with these exceptions, no area of 30.20 crossed the country.

I.—The month opened with the barometer considerably above the normal in Montana, Dakota, and the Saskatchewan Valley. On the 2d this area moved to the southeastward, attended with light rains in Dakota and Nebraska, and a thunder-storm in the latter state. During the 3d the central area reached northern Indiana, after which it spread out rapidly to the east, west, and south, and by the morning of the 4th had entirely lost its identity. During the advance of this area the change in temperature was very slight, except over the Lake Superior region.

II.—This area advanced from the Northwest, with a very ill-defined and uncertain movement. Since the morning of the 4th the pressure in Montana, and westward to the Pacific, had been subjected to many and considerable fluctuations, but by the morning of the 6th a decided rise appeared central in eastern Colorado and western Nebraska; highest barometer, 30.18, at West Las Animas, Colorado, and North Platte, Nebraska. The advance of this area was preceded by light rains southward into Texas.

During the 6th and 7th the area passed eastward into Kentucky, with rapidly diminishing energy, under the influence of low-pressure area number iii advancing from Montana, but as this depression lost its identity in Minnesota on the 8th the effect produced upon the high was only temporary, so that by the morning of the 9th the isobar of 30.30 embraced the middle Atlantic states; highest barometer, 30.33, at Washington City, Baltimore, Maryland, and Philadelphia, Pennsylvania. On the 10th the barometer fell to 30.20, the isobar of that notation

embracing the Gulf and Atlantic coast states. As low area number iv advanced eastward north of the Lakes the high was confined to the Gulf States, where it remained about stationary during the 11th, and disappeared on the morning of the 12th.

III.—This area appeared over Lake Superior on the morning of the 14th and moved southeastward into eastern Pennsylvania by midnight of the following day, disappearing south of Nova Scotia during the afternoon of the 16th. Throughout the entire course of this area the barometer did not rise at any station above 30.11.

IV.—The pressure increased very slowly in the rear of low area number vi, which appeared in western Nebraska on the 15th. On the morning of the 17th, when the depression here mentioned was central on the southwest coast of Nova Scotia, the high appeared central in northern Dakota and the Saskatchewan Valley, with northerly winds, and temperature ranging from 38° to 52°. With increasing pressure the area became central over Lake Superior on the morning of the 18th; highest barometer, 30.28, at Duluth, Minnesota. The northerly winds in advance of the centre were attended with light local rains throughout the central portions of the country, from Kansas eastward to the Atlantic coast. The high advanced steadily eastward to the Atlantic coast with very slight change in pressure at the centre, but rapidly enlarging its area so that by the morning of the 20th, while central off the Maine coast (highest barometer, 30.38, at Yarmouth, Nova Scotia), the isobar of 30.10 embraced nearly the entire country east of the eighty-seventh meridian. The barometer remained above 30.30 off the Nova Scotia coast until the afternoon of the 21st, and at the expiration of the succeeding twenty-four hours the area entirely disappeared to the eastward.

V.—While low-pressure area number xii was advancing eastward from Montana on the 24th and 25th the barometer rose over the upper lakes, so that by the morning of the latter day the isobar of 30.10 embraced the greater portion of the Lake region; highest barometer, 30.16, at Toledo, Ohio. The area now moved southeastward into Pennsylvania and Virginia with gradually diminishing energy, where by the afternoon of the 27th it entirely disappeared, but not until the isobar of 30.00 had embraced all of the territory east of the Mississippi and south of the forty-fifth parallel.

VI.—This area appeared central in western Montana on the morning of the 29th, highest barometer, at Helena, Montana, 30.23. During the succeeding twenty-four hours the pressure at the centre remained nearly stationary while the extent of the area rapidly increased to the southeastward, reaching northern Texas. During the 30th there was practically no eastward movement of the centre, it being confined to either eastern Montana or western Dakota. During the stationary period the temperature was gradually falling at most stations in Montana, the Saskatchewan Valley, and northern Dakota, and by the morning of the 31st the area became central in south-east Dakota; highest barometer, at Huron, Dakota, 30.20. Accompanying this advance of the high the temperature fell from 8° to 15°, although for the previous twenty-four hours it had been decidedly below the normal, and as a result light to heavy frosts were reported from eastern Dakota, western and northern Minnesota, western Iowa, and eastern and northern Nebraska. A killing frost was reported from Huron, Dakota, the station where the highest barometer was recorded and the centre of the area of high located on the morning chart of the 31st. During this day the area rapidly enlarged in extent, forming an ellipse, the major axis of which extended from the northern shore of Lake Superior to the Gulf. By midnight of the 31st the centre was located in eastern Illinois, with diminished pressure, where at the close of the month the progressive movement of the area was eastward over the Ohio Valley and middle Atlantic states.

AREAS OF LOW PRESSURE.

[Prepared by Lieut. JNO. P. FINLEY, Signal Corps, U. S. Army, Assistant.]

Fourteen areas of low pressure have been located within the

limits of the Signal Service tri-daily weather charts for the month of August, 1886. The month has not been marked by the appearance of remarkable features in the development and progress of low-pressure areas. The storm of the 19th and 20th, in the western Gulf and Texas, was one of great severity and rather exceptional movement, yet not remarkable for the month, when it is considered that the last half of August is generally the beginning of the period of cyclonic disturbance in the West Indies and Gulf of Mexico.

With few exceptions the areas of barometric minima developed on the eastern slope of the Rocky Mountains and passed eastward over the Lake region north of the forty-third parallel, reaching the Atlantic coast in the vicinity of Newfoundland.

The following table shows the latitude and longitude in which each area was first and last observed, with the average rate of movement in miles per hour:

Areas of low pressure.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	44 00	75 00	47 00	58 00	23.0
II.....	33 00	83 00	40 00	73 00	22.0
III.....	51 00	106 00	48 00	96 00	29.0
IV.....	50 00	112 00	47 00	57 00	40.0
V.....	48 00	107 00	49 00	59 00	53.0
VI.....	44 00	102 00	44 00	61 00	55.0
VII.....	39 00	97 00	32 00	92 00
VIII.....	27 00	92 00	31 00	100 00	16.0
IX.....	50 00	102 00	42 00	77 00	30.0
X.....	42 00	68 00	46 00	57 00	31.0
XI.....	46 00	107 00	50 00	97 00	28.0
XII.....	47 00	105 00	50 00	60 00	48.0
XIII.....	51 00	67 00	40 00	58 00
XIV.....	38 00	105 00	50 00	62 00	31.0

Average hourly velocity, 34.0 miles.

I.—On the morning of the 1st there was a general but slight depression of the barometer, extending in a narrow belt north-eastward from northern Texas to the lower Saint Lawrence, with local rains in Tennessee, Ohio, and the lower lakes. By afternoon the depression became more circumscribed, with the centre located in northern New York. The rain-area extended from Arkansas and Missouri northeastward to New Hampshire. During the day very heavy rains fell in western Tennessee and eastern Arkansas, over which region the long trough-like depression extended to the southwestward. During the afternoon of the 1st severe local storms occurred in southern Michigan and northwestern Ohio. The low area now moved rapidly northeastward to the Gulf of Saint Lawrence where it lingered during the 3d, with light but general rains and light to brisk winds.

II.—From the morning of the 1st to the 6th light local rains were of daily occurrence in Alabama, northern Florida, Georgia, and South Carolina, with continued but not decided changes in the pressure. During the 6th, however, the barometer continued to fall and a slight irregular depression formed in the Carolinas, accompanied by light rains and light to brisk winds. This area passed off the coast at Norfolk, Virginia, on the night of the 6th, with brisk to high east to north winds and heavy rains. During the 7th it disappeared eastward off the New Jersey coast, with high northeasterly winds and heavy rains, the latter extending to Boston, Massachusetts, and general rains, with fresh to brisk northerly winds to the stations on the Nova Scotia coast.

III.—The barometer had been falling slowly in the Saskatchewan Valley since the morning of the 5th so that by midnight of the 6th a depression was central in about 51° N., 106° W., with light winds and no precipitation. During the 7th the area moved south and east into northern Minnesota, where on the morning of the 8th its easterly movement was checked by the development just at this time of area number iv north of Montana. On the afternoon and evening of the 7th there was a thunder-storm and heavy rain at Huron, Dakota; otherwise there was no precipitation during the formation and progress of this area.

IV.—During the 8th heavy rains and thunder-storms prevailed in eastern Nebraska, southeastern Dakota, and northern Minnesota, with winds shifting to southerly. By midnight of this date the centre of the depression appeared in about 50° N., 112° W., with no precipitation. During the 9th it moved easterly north of the United States, attended by fresh to brisk south winds and light rains in northern Dakota and local storms in northern Minnesota. On the 10th, while the centre was north of the Lakes, light local rains and southerly winds prevailed over that region. During the 11th the depression moved rapidly eastward to the Gulf of Saint Lawrence with fresh to brisk winds and occasionally heavy rains, disappearing to the eastward over Newfoundland on the following day. While the depression was passing eastward north of New York violent local storms occurred in the western portion of that state.

V.—This depression appeared on the morning of the 12th in Montana, with fresh to brisk winds but no precipitation. By midnight light local rains had fallen in Dakota and southeastern Montana, and the small area which sixteen hours before was confined to central Montana had now elongated into a large trough extending southward into New Mexico. On this afternoon violent local storms and tornadoes occurred in southeastern Dakota. This condition became more decided on the 13th, and the trough now extended from the Rio Grande to Lake Superior, with two storm-centres, one in northern Wisconsin and the other in Nebraska. The latter remained about stationary for the succeeding twenty-four hours and finally filled up. The former passed eastward north of the lower lakes with occasional heavy rains and fresh to brisk winds on the 13th. During the 14th the depression moved rapidly east and northeast to the Gulf of Saint Lawrence, disappearing over Newfoundland on the following morning.

VI.—This depression appeared on the afternoon of the 15th in western Nebraska and southwestern Dakota, and during the remainder of the day elongated to the northeast and southwest so as to embrace Minnesota, Kansas, and Colorado. In connection with this change in the form of the depression there occurred very violent and destructive local storms, principally hail, in eastern Dakota and Minnesota. On the 16th the depression still maintained an elongated form, but changed the direction of its major axis so as to lie more nearly east and west. This feature was very decidedly marked during the afternoon and evening, so that while the principal storm-centre was over Lake Erie the depression extended from northern New York westward to Utah. On this afternoon violent local storms occurred in eastern Ohio, western Pennsylvania, and tornadoes in western New York. On the morning of the 17th there was still a trough-like depression of 29.90, extending westward to Kansas, within which region there were occasionally heavy rains and thunder-storms. During the day the depression moved eastward over New England, and by midnight disappeared off the Nova Scotia coast. Very heavy rains fell at stations on the latter coast, and also on the Maine coast, but the winds were only fresh to brisk.

The following notes from Signal Service observers are of interest:

Davenport, Iowa: on the 12th a thunder-storm, with light rain, prevailed from 5.30 to 5.55 p. m., followed by a high southwest wind of thirty-two miles per hour from 5.40 to 6.35 p. m.

Sandusky, Ohio: on the 13th a thunder-storm and heavy rain began at 5.40 and continued until 7.05 a. m. Brisk to high winds prevailed from 5.40 to 6.30 a. m.

By reference to the descriptions of storms in this REVIEW under the headings of "Local storms and tornadoes" and "Thunder-storms for August, 1886," it will be seen that many thunder-storms occurred on the 12th and 13th in the sections over which this low area prevailed.

VII.—It was in consequence of the great elongation to the westward of number vi that impetus was given to the development in eastern Kansas on the 17th of low-pressure area number vii. On this afternoon severe local storms occurred in

southern Missouri, and thunder-storms in Tennessee, Kansas, and Colorado. The depression progressed very slowly south-eastward, with diminishing energy, and finally disappeared altogether by the morning of the 19th in northern Louisiana. There was at that time a violent storm (number viii) moving westward over the Gulf in about 25° N., 90° W., but there is no evidence to indicate that number vii merged with that depression.

VIII.—The first indication of this depression is given by the steamship "San Marcos," of the Mallory Line, which plies between New York City and Galveston, Texas. This steamer left the latter port on the 18th. On the following day, in $27^{\circ} 55'$ N., $91^{\circ} 22'$ W., the following observation was made: barometer, 29.84; temperature, 84° ; wind, east; force, 6; frequent squalls with very heavy southeast swell. Owing to the rough weather very little headway was made, so that on the 20th the ship was in $27^{\circ} 23'$ N., $89^{\circ} 21'$ W., where the barometer read 29.92, temperature 84° , wind southeast by east, force 4; frequent squalls with long east-southeast swell.

On the morning of the 19th the winds at stations on the west Gulf coast had shifted to northerly and increased from light to brisk. By midnight the wind fell to a dead calm at Galveston, Texas, but increased to forty miles per hour from the northeast at Indianola, Texas, where the barometer registered 29.76, a fall of .09 since 7 a. m. At Brownsville, Texas, the barometer read 29.69, a fall of .15 since 7 a. m. At the expiration of the next eight hours the barometer fell to 28.89 at Indianola, Texas, a change of .87, wind northeast, seventy-two miles. The building occupied by the observer was crushed to pieces, causing the death of the latter. The whole town was given over to the fury of the elements, and not a building was left standing when the storm cleared away.

While the storm was thus raging at Indianola (7 a. m. of the 20th), the surrounding stations rendered the following reports: Galveston, barometer, 29.67; wind, northeast; forty-nine miles; clear; maximum velocity since midnight, fifty-three miles. Brownsville, barometer, 29.63; temperature, 78° ; wind, northwest; eight miles; fair. Rio Grande City, barometer, 29.71; thermometer, 77° ; wind, northwest; eight miles; cloudy. San Antonio, barometer, 29.69; temperature, 79° ; wind, northeast; twenty miles; cloudy.

The storm had now left the Gulf and was moving north-westward over Texas, in the direction of San Antonio, at which place by 11.30 a. m. (20th) the wind increased to a gale from the northeast and the barometer fell to 28.74, a change of .95 since 7 a. m. At 12.30 p. m. the barometer read 28.59; at 1.30 p. m., 28.35; at 2.30 p. m., 28.03, and at 2.40 p. m., when shortly after the building was nearly destroyed, the barometer read 28.02, and the velocity of the wind was estimated at over eighty miles per hour. The storm passed away with southeasterly winds. No lives were lost in San Antonio, but property was damaged to the extent of about \$60,000.

At 3 p. m., while the storm-centre was over San Antonio, the following observations were made at surrounding stations: Galveston, east of storm-centre, barometer 29.81, or $+0.14$ inch in eight hours; temperature, 77° ; wind, southeast, thirty miles; raining; the maximum in past eight hours being fifty miles. Brownsville, southeast of centre, barometer, 29.69, $+0.06$ inch in eight hours; temperature, 91° ; wind, south, twelve miles; cloudy. Rio Grande City, south of centre, barometer, 29.70, -0.01 inch; temperature, 98° ; wind, northwest, six miles; fair. Palestine, northeast of centre, barometer, 29.88, -0.01 inch; temperature, 81° ; wind, east, eleven miles; threatening. Abilene, northwest of centre, barometer, 29.86, -0.04 inch; temperature, 82° ; wind, east, eighteen miles; cloudy. Fort Davis, west of centre, barometer, 29.80, -0.06 inch; temperature, 85° ; wind, north, sixteen miles; cloudy. El Paso, west of centre, barometer, 29.77, -0.07 inch; temperature, 92° ; wind, east-northeast, light; clear.

By 10 p. m. of the 20th the barometer had risen 1.06 at San Antonio, wind southeast, brisk, cloudy. At other stations to the eastward the increase in pressure ranged from .05 to .11,

while to the westward the fall ranged from .02 to .10, with threatening weather and rain, the greatest change taking place at Abilene, located due northwest of San Antonio, where the wind had shifted to northerly and increased in velocity from eighteen to thirty-seven miles per hour.

By morning of the 21st the barometer had risen decidedly at all stations throughout Texas, the greatest change taking place at Abilene, near the centre of the state, where the rise in the past eight hours was .24. In the next eight hours a decided fall had taken place in west Texas and southeastern New Mexico, the circulation and the increased velocity of the winds, together with the precipitation, indicating the presence of the depression, which by this time was rapidly diminishing in energy. From the afternoon of the 21st to morning of the 22d heavy rains and high winds prevailed in the Panhandle of Texas and eastern New Mexico. The depression now rapidly filled up and entirely disappeared during the 22d. During its passage through Texas the depression was accompanied by violent local storms in the central and northern portions of the state.

The following notes from Signal Service observers and other sources will serve to show the severity of this storm:

Galveston, Texas: the storm which prevailed here during the night of the 19th and morning of the 20th was even more destructive to life and property than the noted storms of 1867 and 1875. The following description of this storm is furnished by the observer at Galveston:

During the 19th the barometer fell quite rapidly but did not get dangerously low, standing at 29.78 at 10 p. m. The lowest noted during the storm was at 7 a. m. of the 20th, 29.67, at which time it began rising and went up even more rapidly than it fell.

On the 19th the wind was from the northeast and east, attaining a storm velocity of twenty-seven miles per hour at 2.10 p. m., then lulling awhile it again set in with renewed violence, attaining a maximum velocity of fifty-three miles from the northeast at 6.40 a. m. of the 20th, after which it decreased very slowly in velocity, the gale ending at 10.45 p. m. On the morning of the 20th the wind backed to east and southeast, continuing brisk until 3 p. m. of the 21st. The weather was fair to cloudy on the 19th, with rain from 10.25 to 11.05 p. m. Rain again began during the night and continued, with varying intervals of cessation, until 10.10 p. m. of the 20th. The wind of the 19th caused the water in the Gulf to become very high, and the cars of the street railroads stopped running about 7 p. m. The water continued to increase in depth, reaching its maximum, four to six feet, at 7 a. m. of the 20th, and remained nearly stationary until 9 a. m., when it rapidly subsided.

The high tide in the Gulf led many to expect an overflow and to prepare for it. Few persons slept that night, and when their fears were realized by the water reaching yards, and then entering houses, the inhabitants set out for places of safety, some in boats and others in hastily constructed rafts. Daylight found the water running in streams across the island from the Gulf of Mexico to Galveston Bay, carrying with it the debris of fences, houses, trees, clothing, furniture, etc. During the storm more than one hundred and sixty houses were more or less damaged, some carried away; a large building used as a skating rink was demolished, loss \$5,000; as were also the surf bath-houses, the Mexican Cable Company's building, and a large building called the Pagoda. The Texas-Mexican and street railroad lines were badly damaged; the tracks of the Santa Fe and Missouri Pacific Railroads were washed out at their approaches to the bridge, and on the mainland several miles of track were washed out or otherwise badly damaged. No telegraph connection could be made until late in the afternoon of the 20th. Many of the telephone wires in the city were broken, and the lines of the fire-alarm system disordered. The schooner "Livonia Perkins," forty tons, engaged in the lumber trade, was capsized at 9 p. m. of the 19th and two men were drowned. The schooner "S. W. Perry" was wrecked and two men drowned. The schooner "Ella Elliott" was stranded and wrecked, loss \$30,000, besides cargo of ice. Numerous other smaller vessels and yachts were capsized and otherwise damaged. The entire loss of property is estimated at \$150,000. No trains arrived or left the city from the night of the 19th until 9 p. m. of the 21st.

Indianola, Texas: during the afternoon of the 19th the weather was threatening and the wind strong from the northeast; at 8 p. m. the wind moderated somewhat, but soon rose again, becoming strong enough at 9 p. m. to cause some alarm. From that time the force of the wind gradually increased, veering slightly, and about daylight the water in the bay commenced to rise rapidly; at this time the wind was blowing at the rate of seventy-two miles per hour and the Signal Office building gave way; in attempting to escape, the observer, I. A. Reed, was killed by falling timber. A lamp in the office set fire to the building and, although rain was falling heavily, it was burned, and also more than a block of buildings on both sides of the street. Shortly after daylight the wind grew stronger, blowing from the east; about 5 a. m. of the 20th most of the damage to property was done. Houses were falling and floating from their foundations, and the people were crowded together in such places as were considered most secure, unable to do anything to save their property. More than

twenty lives were lost at Indianola, and it is believed that the number would have been much larger but for the fact that the worst of the storm did not come until after daylight. About 11 a. m. the wind had moderated perceptibly and by night was only a light south breeze. The water receded very slowly, however, and it was not until the afternoon of the 22d that the main street was free from water. The appearance of the town after the storm was one of universal wreck. Not a house remained uninjured, and most of those that were left standing were in an unsafe condition. Many were washed away completely and scattered over the plains back of the town; others were lifted from their foundations and moved bodily over considerable distances. Nearly three miles of the Gulf, Western Texas, and Pacific railroad track were torn up and scattered on the prairie. Over all this strip of low ground, as far as could be seen, were the wrecks of houses, carriages, personal property of all kinds, and a great many dead animals. Very few people were able to save anything whatever, and as the houses which were left were scarcely habitable the town was deserted as fast as possible.

San Antonio, Texas: the morning of the 20th opened with light rain and brisk northeasterly winds. Light rain continued until 9 a. m., when high northerly wind and heavy rain set in; the wind gradually increased in force until shortly after 11 p. m. it had attained the velocity of a gale, unroofing several buildings, including the signal station; with the latter roof, the anemometer and wind vane were carried away. The wind attained its highest velocity at 2 p. m.; estimated velocity eighty miles per hour. Much damage was done in this town and vicinity by the violence of the wind; the quartermaster's corral was completely demolished, and a considerable quantity of grain and hay destroyed. All telegraph and telephone communication was cut off. Small hail-stones fell from 2 to 2.15 p. m.; amount of rainfall 4.40 inches. After the centre of the storm had passed the wind backed to northeast, east, and southeast, where it remained stationary during the afternoon and evening.

Corpus Christi, Texas: a hurricane passed over this place on the night of the 19-20th, doing much damage to property. Four buildings, including a church, were destroyed, and telegraph communication was completely cut off. At Luling the storm commenced about daylight, and was accompanied by unusually heavy rain. Several houses were destroyed, numerous trees were blown down, and cotton was stripped from the stalk and blown over the fields. At Beeville many houses in course of construction were demolished, and numerous other buildings unroofed or otherwise injured.

Abilene, Texas: the morning of the 20th opened with cloudy weather and gentle wind from the south; during the day the wind increased in force, attaining at night a velocity of thirty-three miles per hour, and backing to the northeast. Rain began falling at 7.20 p. m. During the early morning of the 21st the wind veered from northeast to southeast and continued blowing a gale, reaching a maximum velocity of forty-eight miles per hour about 4 a. m., after which it began to subside, at the same time veering toward the southwest. Only slight damage was done by the storm.

Seguin, Guadalupe county, Texas: at 6.30 a. m. of the 20th rain began falling, with light wind from the north. At 8 a. m. the wind began to increase in force, shifting to the northeast at 10 a. m., and continuing to increase in velocity until, from 11 a. m. to 1 p. m., it blew at the estimated rate of eighty-five miles per hour. A number of buildings and trees were blown down and numerous dwellings unroofed. Moderate rain fell during the storm, but no thunder or lightning occurred.

Houston, Texas: the storm of the 19th and 20th began here about 7 p. m. of the 19th and continued to increase in violence during the night. Rain began falling at 11 p. m. At 9 p. m. the wind reached its greatest velocity, breaking numerous trees, but doing no damage to buildings. The water in Buffalo Bayou was higher than ever known before, being forced up by the high water of the Gulf.

Victoria, Victoria county, Texas: a very severe storm prevailed here at 5 a. m. of the 20th. The wind blew with hurricane force, and much property was destroyed. Forty buildings, including six churches, were completely destroyed. The estimated value of the property destroyed in the town and county is \$100,000.

Cuero, De Witt county, Texas: a severe storm of wind and rain prevailed here between 6 and 11.30 a. m. of the 20th. Numerous buildings were wrecked and property of all kinds damaged.

IX.—This depression first appeared in the Saskatchewan Valley at midnight of the 20th, and during the following day moved southeastward into Minnesota, attended by violent local storms in the latter state and southeast Dakota, with heavy rains and thunder-storms in the southern portion of Wisconsin. During the 22d the depression moved southeastward to the lower lakes, where it gradually dissipated by the afternoon of the following day. While the area was central in southern Michigan on the afternoon of the 22d violent local storms occurred in northern Indiana and western Ohio. The final disappearance of the depression in western New York may have been influenced by the presence of low-pressure area number x, which on the morning of the 23d had just reached the southwest coast of Nova Scotia.

The following notes relative to this area of low pressure are from the reports of Signal Service observers:

Saint Paul, Minnesota: during the 21st light to fresh winds prevailed until

6.48 p. m., when the wind veered to west and suddenly increased in force to a gale of twenty-five miles an hour. From 7.00 to 7.40 p. m. a maximum velocity of west thirty-one miles was attained, during which time several chimneys, signs, and windows were blown down.

La Crosse, Wisconsin: three light thunder-storms occurred at intervals between 5.40 a. m. and 2.25 p. m. on the 21st. Very heavy rain and severe thunder-storm set in at 8.50 p. m.; the storm passed from northwest to southeast. At 9.05 p. m. a gale of thirty-six miles per hour set in from the southeast. No serious damage was done by wind at this place. All telegraph lines between here and Saint Paul were down, and several persons were drowned by boats capsizing on Lakes Minnetonka, Pepin, and Cedar.

Delavan, Walworth county, Wisconsin: at 3 p. m. of the 21st heavy clouds gathered in the west and the wind began to blow briskly from the southwest; at 4.10 p. m. the wind changed to northwest and blew with the violence of a gale. At this time the thermometer registered 87°, at 4.40 p. m. 72°, dropping 15° in half an hour. Light rain and heavy thunder-storm set in at 5.50 p. m., and at 6 p. m. the wind was perfectly calm. At 6.05 p. m. a gale suddenly set in from the northwest, blowing in gusts, with an interval of a few seconds between; this high wind continued only five minutes, but blew down a large tobacco warehouse, broke off growing corn, and destroyed hundreds of shade trees. During the storm a barn was struck by lightning and burned. At 8.35 p. m. hail began falling; the stones were small, doing no damage.

X.—This depression is an ocean storm whose presence was first felt by the New England coast stations at midnight of the 22d. The parabolic curve of its path brought the depression southeast of Yarmouth, Nova Scotia, on the morning of the 23d, the barometer at that station having fallen .33 in the past eight hours, with heavy rain, and wind shifting to northerly. During the day the depression disappeared over the ocean.

XI.—The barometer fell quite rapidly during the afternoon of the 23d in eastern Montana, and on the following day in northwestern Dakota and Manitoba. The winds were southerly and brisk to high, with the temperature ranging from 96° to 102° on the afternoon of the 24th in Dakota, Minnesota, and Manitoba. No rain accompanied the area throughout its course, which was probably cut short in its easterly movement by the advance of low-pressure area number xii.

XII.—By the morning of the 25th this depression became well established in northeastern Montana, but no rain fell until the afternoon, when the area was then central in the extreme northern portion of Dakota. During the remainder of its course this depression passed eastward too far north to make it possible for Signal Service stations to observe any important changes in its progress.

XIII.—This depression suddenly appeared to the north of the mouth of the Saint Lawrence, and during the day passed southeastward over the Gulf, attended by threatening weather and occasional light rains.

XIV.—Since midnight of the 25th the barometer had been slowly falling in eastern Colorado and western Kansas, but the weather remained clear or fair throughout those states, Indian Territory, and Nebraska. By midnight of the 27th rain had fallen throughout Colorado and western Nebraska, with the area central in northwestern Kansas. During the 28th it moved northeastward throughout southern Iowa, northern Illinois, and southern Wisconsin, accompanied by occasional heavy rains and thunder-storms. On the morning of the 29th the depression became much elongated, the major axis extending from Lake Superior southwestward to Texas, throughout which region occasional heavy rains and thunder-storms occurred during the day. By midnight the trough had widened considerably, while moving to the eastward, and now embraced the central Mississippi valley and the Lakes; rain and occasional thunder-storms prevailed throughout this region. The spread of this trough from the Lakes to the Gulf remained intact up to midnight of the 30th, with rain throughout the east Gulf, south Atlantic, and middle Atlantic states, and the lower lake region. The heaviest rains of the month in Virginia, Pennsylvania, and New York occurred during the passage of this area on the 30th. During the 31st the area passed eastward just north of the Saint Lawrence, with rain throughout New England and the Canadian Maritime Provinces, followed by winds shifting to northwesterly and clearing weather.

NORTH ATLANTIC STORMS DURING AUGUST, 1886.

[Pressure in inches and millimetres; wind-force by Beaufort scale.]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined; approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to September 20, 1886.

Twelve depressions are traced, of which seven, numbers 2, 3, 4, 7, 8, 10, and 12, are continuations of storms which first appeared over the North American continent; number 1 is a continuation of ocean depression number 12 charted for July, 1886; numbers 5 and 6 first appeared in the vicinity of the Windward Islands, and are traced over the Caribbean Sea and Cuba; and numbers 9 and 11 are first charted over the ocean west of the seventieth meridian. Three depressions, numbers 2, 3, and 4, are traced across the ocean from coast to coast.

The following presents the characteristics of the depressions traced for the present month, as compared with those traced over the north Atlantic for August, 1885:

In August, 1885, seven storm-areas appeared over the ocean, four of which displayed considerable energy; one apparently originated within the sub-tropical region, between latitude 25° and 30° N., and one was a continuation of a West Indian hurricane which caused many disasters along the coast of the Carolinas during the last decade of the month.

In August, 1886, the cyclonic depressions which passed over the north Atlantic Ocean and the West India islands were exceptionally destructive, and reports indicate that the gales or hurricanes accompanying their passage were the severest experienced during corresponding months in many years. The abnormal energy displayed by the depressions may be attributed to the unusual warmth of the water in the north Atlantic Ocean which caused large evaporation, and the great humidity of the atmosphere was conducive to the development of violent features attending the cyclonic circles.

The month opened with an area of low pressure west of the British Isles, causing fresh gales between the twentieth and thirtieth meridians. Generally unsettled and stormy weather prevailed north of the forty-fifth parallel until the 4th, when it commenced to clear west of the fortieth meridian, the settled condition extending eastward to the European coast during the next four days. On the 9th the pressure was low west of Ireland, in W. 21°, and southeast of Newfoundland; from this date until the 15th the weather over the ocean was generally unsettled, with frequent gales and rain. From the 13th to the 23d the passage of hurricanes through the Caribbean Sea caused severe disturbances over the West India Islands and adjoining waters. From the 15th to 20th the weather was comparatively settled over the north Atlantic Ocean, while during the balance of the month severe storms were frequent, more especially over the western portions.

The following are brief descriptions of the depressions traced:

1.—This was a continuation of ocean depression number 12 traced for July, 1886, and is taken up on the 1st in N. 52°, W. 19°. During this date it moved north of east and was central on the 2d north of Ireland, after which it disappeared to the northeastward. This storm apparently possessed small energy, and special reports relative to its passage have not been rendered.

2.—This storm was a continuation of land depression number 1, and passed northeast over the southern portion of Newfoundland during the 3d, with pressure ranging to about 29.20 (741.7). On the morning of the 4th the depression was central in N. 51°, W. 46°; continuing a north of east course it is traced

to N. 57°, W. 26° by the 6th, during which date it passed beyond the region of observation. During the 2d, 3d, and 4th this depression possessed great energy and dominated the weather conditions over a large extent of the western ocean; accompanying its passage into high latitudes, a marked increase of pressure and loss of strength were shown.

The following special reports were received from vessels which came within the influence of this depression; the reports indicating that, in instances, subsidiary disturbances attending the general storm were encountered:

The s. s. "Horn Head," Capt. M. R. Thompson, commanding, encountered a gale, force 8, during the 1st and 2d; lowest barometer, 29.68 (753.9), at 6 p. m. of the 2d, when in N. 36° 41', W. 68° 27'. Wind set in from ssw., changed to sw., w., and wnw. during the storm, these changes being gradual from 4 p. m. to 9 p. m. of the 2d, and to nw., n., and ne. following the passage of the disturbance. For several days previous the wind had been south and the weather very warm and moist, with high, steady barometer. The captain further states that this disturbance was remarkable for the very great amount of electricity displayed and the tremendous downpour of rain which took place from 3 p. m. to 9 p. m. of the 2d.

Chief Officer A. O. Welch, of the s. s. "Easington," Capt. D. Morgan, commanding, reports: "August 2d, in N. 43° 6', W. 51° 50', a moderate gale began at night from sw., veering to w., and on the 3d to s. by w., and increased to fresh gale, with terrific squalls and high seas; veered to w. in p. m., and continued until 4 p. m. of 4th, then moderated and veered to nw. Lowest barometer, 29.41 (747.0), at noon on 3d, when in N. 42° 46', W. 55° 42'."

Capt. M. P. Lund, commanding the s. s. "Durham City," reports: "August 2d, 8 p. m., in N. 45° 32', W. 54° 20', a strong gale began from sw., with heavy rain; gale continued through the 3d in N. 43° 36', W. 58° 54', veering to nw. in p. m., and increasing to a whole gale, with hard squalls; ship rolled heavily and shipped seas; gale continued until early a. m. of 4th, then moderated. Lowest barometer, 29.29 (744.0), at 4 a. m. of the 3d, when in N. 43° 36', W. 58° 54'."

The s. s. "Island," Capt. W. Skjold, commanding, on the 2d, in N. 43°, W. 52° 45', had a fresh se. gale, with heavy rain and falling barometer; at 8 a. m. of the 3d the barometer read 29.53 (750.0); wind then changed to w. and moderated, with clearing weather; then changed to sw. and freshened; at 9 p. m. the wind changed suddenly to w. in a squall, blowing a high gale, with a very heavy sea.

The s. s. "Ocean Prince," Captain Milburn, commanding, on the 3d, in N. 43° 10', W. 45° 55' (at noon), had wind increasing to a whole gale, sw., at 3 p. m., with a very heavy sea from ssw. and another not quite so heavy from w., between which the ship labored heavily and shipped large quantities of water; lowest barometer, 27.71 (754.6), at 7 p. m.

The s. s. "City of Chicago," Capt. F. Watkins, commanding, experienced a fresh gale, force 8, during the 3d and 4th; lowest barometer, 29.23 (742.4), at 4 a. m. of the 3d, when in N. 45° 40', W. 53° 30'; wind set in from sse., veering to s., ssw., sw., and wsw. during, and to w. following, the storm. The wind was strongest from wsw., and a fresh gale continued for eighteen hours, with clear, pleasant weather.

The s. s. "State of Alabama," Captain Gaudy, commanding, had a fresh gale during the 3d and 4th; lowest barometer, 29.21 (741.9), at 4 a. m. of the 3d, when in N. 42° 59', W. 56° 43'; gale set in from s., veering to sw., w., and wnw., during, and continuing westerly following, the storm. The s. s. "Werra," Capt. R. Bussius, commanding, had a strong gale on the 3d and 4th; lowest barometer, 29.36 (745.7), at 4 a. m. of the 3d, when in N. 42° 34', W. 59° 42'; wind set in from wsw. and veered to w. and wnw. The s. s. "Ripon City," Capt. John Jenkins, commanding, had a fresh gale on the 4th and 5th; lowest barometer, 29.40 (746.7), at noon of the 4th, when in N. 48° 36', W. 49° 16'; gale set in from sw., veering to w. and wnw.

The s. s. "Wetherby," on the 6th, in N. 56° 11', W. 21° 40'

(at noon), had a moderate gale, w., beginning at 4 p. m.; at 8 p. m., heavy squalls and high seas; wind veered to nw. in a. m. of the 7th, in N. 54° 59', W. 25° 17' (at noon), and a moderate gale, nw., continued until midnight. Chief Officer Milne, of the s. s. "Grafton," Capt. J. Seaborne, commanding, reports a strong gale on the 7th; position at noon, N. 51° 13', W. 26° 8'. At 1 a. m. gale began from w., with heavy squalls, rain, and high seas, and moderated in p. m.; barometer ranged from 29.96 (761.0) at midnight of the 6th to 30.00 (762.0) at noon of the 7th.

3.—This storm was a continuation of land depression number ii, and passed eastward off the coast in about N. 37° during the 7th. Following a generally north of east course this depression is traced across the ocean, being central over Ireland on the 13th. The storm gathered strength during its passage, exhibiting very low pressure, about 29.00 (736.6), on the 11th, when central in N. 51°, W. 34°, after which date it commenced to fill up, although very violent disturbances continued to attend its eastward movement.

The following reports were made relative to this depression:

The schooner "Cephas Starrett," on the 7th, off Barnegat, had a heavy ne. gale with heavy seas, lasting eight hours, in which vessel labored heavily, causing her to spring a leak and put back for repairs. The s. s. "Wetherby," 10th, in N. 50° 30', W. 37° 25', at 8 p. m., had a fresh breeze, ssw.; 9 p. m., wind suddenly veered to n., blowing strong gale and continuing with terrific squalls and high seas; 11th, in N. 48° 33', W. 41° 40', wind backed to nw. at noon, and moderated; lowest barometer, 29.28 (743.7), from 8 p. m. to midnight of 10th. Capt. H. McKay, commanding the s. s. "Servia," reports having encountered a gale on the 9th and 10th, commencing from the se. on the 10th, when in N. 50° 22', W. 30° 58', and ending during the evening of the 11th in N. 48° 31', W. 40° 12'; wind shifted to w. and nw.; lowest barometer, 29.00 (736.6), from 4 to 7 a. m. of the 11th. Capt. A. McKay, commanding the s. s. "Catalonia," reports: "10th, in N. 46° 28', W. 42° 09' (at noon), at 8 p. m. experienced the first of a westerly gale, wind west, force 6, barometer 29.98 (761.5), and falling slowly; midnight, barometer 29.90 (759.4), wind west, force 8, sea rising fast, and every indication of a high gale. 11th, 8 a. m., barometer 29.90 (759.4), wind and sea increasing; noon, wind w., force 10, barometer 29.90 (759.4), hard squalls and very high west sea; 6 p. m., barometer rising, and indications of gale moderating; midnight, wind west, force 8, with hard squalls, high sea, and rising barometer. Gale ended at noon of 12th, with wind w."

The s. s. "Wisconsin," Captain Bentley, commanding, on the 11th, in N. 50° 13', W. 31° 29', had heavy gale to hurricane, veering from s. to nw. The s. s. "Ems," Capt. T. Jungst, commanding, on the 11th, in N. 49° 34', W. 23° 48', had gale from s., force 5 to 6, with rain, commencing at 6.35 a. m.; 12.56 p. m., in N. 49° 21', W. 26° 36', wind suddenly shifted to w., force 7, weather clearing; 7.56 p. m., in N. 49° 11', W. 28° 59', wind had increased to whole gale with heavy squalls and a fearful sea, wind nw., barometer 29.41 (747.0); wind moderated at night from nnw.; high swell from ne. and ene. on the 12th. The bark "Western Chief," Capt. F. Sander, commanding, on the 11th, in N. 48° 10', W. 35° 23' (at noon), had a strong gale, nw., with very violent squalls and high, cross seas; barometer fell to 29.43 (747.5).

The s. s. "Grafton," on the 10th, in N. 49° 55', W. 40° 26' (at noon), had fresh se. breeze and heavy rain beginning at 4 p. m.; at 6 p. m., suddenly veered to n. and blew strong gale with high seas, and continued, backing to nw. in a. m. of the 11th, in N. 48° 6', W. 45° 0', and moderated at 4 a. m.; lowest barometer, 29.66 (753.4), at midnight of the 10th. The s. s. "England," Capt. T. P. Heeley, commanding, had a fresh gale, s. veering to nw., on the 10th and 11th; lowest barometer, 29.40 (746.7), at midnight of the 10th, in N. 48° 35', W. 38° 10'. The s. s. "Ethiopia," Captain Wilson, commanding, had a whole gale, force 10, on the 10th and 11th; wind set in from se. and veered to nw.; lowest barometer, 29.16 (740.7), at mid-

night of the 10th, in N. 50° 58', W. 37° 45'. Chief Officer Davis, of the s. s. "Virginian," Capt. M. Pitt, commanding, reports having encountered a fresh to strong gale with hard squalls and rain on the 11th, in N. 47° 22', W. 36° 26' (at noon); wind veered from sw. to nw. and backed to w.; lowest barometer, 29.51 (749.5), at 9.44 a. m.

The s. s. "State of Pennsylvania," Capt. A. J. A. Mann, commanding, had a gale from se., backing to nw. on the 11th and 12th; lowest barometer, 28.99 (736.3), at 4.15 p. m. of the 11th, when in N. 53° 0', W. 33° 20'. Capt. E. Bently, commanding the s. s. "Wisconsin," reports: "Had a hurricane on the 11th, in N. 50° 13', W. 31° 29' (at noon). At midnight of the 10th, barometer, 29.95 (760.7); at 4 a. m. of 11th, 29.59 (751.6), wind se.; 8 a. m., 29.09 (738.9), wind sw.; noon, barometer 28.89 (733.8), wind wsw.; 2 p. m., 29.04 (737.6), wind wnw.; at this hour the wind blew with hurricane violence until 4 p. m.; at 6 p. m. the wind changed to nnw., and at midnight the barometer had risen to 29.59 (751.6), with a strong gale blowing; had to keep ship's head to the sea." The s. s. "Pavonia," Capt. Bentley Woolfenden, commanding, experienced a strong gale on the 11th and 12th; wind veered from s. to w.; lowest barometer, 29.26 (743.2), at 1 a. m. of the 12th, in N. 51° 15', W. 15° 46'. The gale was accompanied by rain, hard squalls, and high seas.

Capt. Wm. Tyson, commanding the s. s. "Holland," reports: "A gale commenced at daylight on the 11th from sw.; barometer falling very fast; at 4 p. m., in N. 49° 40', W. 27° 53', barometer at its lowest, 29.08 (738.6); wind then veered to wnw., and increased in violence till midnight, when it blew a very heavy gale, with squalls of exceptional severity for the time of year, accompanied by a dangerous, confused, cross sea. By noon of the 12th the gale had moderated and was followed by fresh nw. winds." Chief Officer Stenbridge, of the s. s. "Norseman," Capt. E. Maddox, commanding, reports: "August 11th, in N. 50° 25', W. 28° 37' (at noon); 8 a. m., strong breeze, s., with rain-squalls; 10 a. m., veered to sw., increasing to fresh gale, with heavy squalls, then veered to w., blowing strong gale, continuing till 6 a. m. on the 12th in N. 49° 54', W. 32° 19' (at noon); barometer 29.34 (745.2) at noon of the 11th."

The s. s. "Leerdam," Capt. P. Slierendregt, commanding, had a heavy gale on the 11th and 12th; wind veered from ssw. to nw.; lowest barometer, 28.94 (735.1), at 3.05 a. m. of the 12th in N. 49° 50', W. 23° 30'. The bark "Orion," Capt. A. Mathiesen, commanding, on the 11th, in N. 47° 18', W. 29° 4' (at noon), had a gale, w., commencing at 5 a. m.; barometer continued falling until 10 p. m., with gale increasing; 6 to 9 p. m., gale from wnw., with rapidly increasing sea; gale continued all night, decreasing and backing to westerly at 8 a. m. of the 12th. Capt. H. E. Nickels, commanding, the s. s. "Noordland," reports having encountered a whole gale on the 11th and 12th. Gale set in from se., veering to westerly; lowest barometer, 29.01 (736.8), at 9.50 a. m. of the 11th when in N. 50° 34', W. 27° 38'.

The s. s. "Pietre de Connick," Capt. E. Smit, commanding, experienced a strong gale on the 12th and 13th. Wind set in from ssw. and veered to nw., with heavy seas and hard squalls until 2 a. m. of the 13th; lowest barometer, 29.71 (754.6), at 12 noon of the 12th, in N. 49° 16', W. 26° 45'. The s. s. "Marengo," Captain Abbott, commanding, had a strong gale with high seas, heavy squalls, and rain on the 12th and 13th. Wind set in from s. and veered to westerly; lowest barometer, 29.31 (744.5), at noon of the 12th, in N. 49° 30', W. 18° 44'. The s. s. "Camellia," Captain Buck, commanding, on the 11th had a heavy gale from ssw. to nnw., lasting from noon to 6 p. m. of the 12th; ship's position N. 50° 16', W. 24° 5', to N. 50° 30', W. 24° 30'; barometer 29.10 (739.1). Captain Manley, commanding the s. s. "Borderer," reports: "During the p. m. of the 13th, at the entrance of the English Channel, it blew a moderate gale from the sw., attended with very heavy rain, some of the showers being almost a sheet of water; at 7 p. m. the wind shifted to nw. and the sky cleared."

4.—This storm was a continuation of land depression num-

ber iv, and passed eastward over the Gulf of Saint Lawrence and Newfoundland during the 12th. Following a generally north of east course the depression is traced across the ocean to the west coast of Scotland, where it passed beyond the region of observation during the 16th. This storm advanced very rapidly, and was attended by violent disturbances. The barometric pressure decreased as the low area moved eastward, and readings ranging below 29.30 (744.2) were recorded on the 15th.

The following special reports relative to this storm are at hand:

The s. s. "British Princess," Capt. E. H. Freeth, commanding, on the 14th, in N. 51° 18', W. 24° 43', had a gale from ssw., suddenly increasing from force 5 to force 10, with very high sea; barometer 29.53 (750.0); wind went to wnw. The s. s. "Leerdam," Capt. P. Slierendregt, commanding, on the 14th and 15th, had a whole gale, westerly; lowest barometer, 29.60 (751.8), at 6 p. m. of the 14th, in N. 49° 40', W. 36° 5'. The s. s. "Pavonia," Capt. Bentley Woolfenden, commanding, on the 14th and 15th, had a strong gale with heavy rain and high westerly sea; wind veered from sw. to nw.; lowest barometer, 29.62 (752.3), at 7 a. m. of the 15th, in N. 50° 19', W. 29° 34'. The s. s. "Canadian," Capt. John Kerr, commanding, on the 15th and 16th, had a strong gale, westerly; lowest barometer, 29.55 (750.6), at 12 noon of the 15th, in N. 52° 23', W. 20° 20'. The s. s. "State of Georgia," Capt. G. Moodie, commanding, on the 15th and 16th, had a strong to whole gale, ssw., veering to nw. and backing to sw., blowing heaviest from nw. on the 16th; lowest barometer, 29.33 (745.0), at 6 p. m. of the 15th, in N. 55° 23', W. 11° 44'.

The s. s. "Britannic," Capt. H. Perry, commanding, on the 15th, in N. 51° 18', W. 23° 56', had moderate to strong westerly gale and high sea. The s. s. "City of Richmond," Capt. A. W. Lewis, commanding, on the 15th, in N. 49° 40', W. 35° 48', had a strong gale, w. to nw., with heavy head sea. The s. s. "Eider," Capt. H. Helmers, commanding, on the 15th, in N. 48° 29', W. 25° 52', had a fresh gale, sw. to nw., with high head sea. The s. s. "La Bretagne," Capt. M. de Jouselin, commanding, on the 15th and 16th, had a moderate gale, ssw., veering to nw.; lowest barometer, 29.84 (758.0), at 1 p. m. of 15th, in N. 50° 15', W. 12° 0'. The s. s. "Borderer," Capt. Fred Manley, commanding, on the 15th and 16th, in N. 49° 10', W. 26° 19' (at midnight of 15th), had a strong gale, westerly; gale strongest at about 1.30 a. m. of 16th, when ship pitched violently and shipped quantities of water.

5.—This was a tropical cyclone and first appeared on the 13th over the western portion of the Caribbean Sea, from whence it moved north of west into the Gulf of Mexico by the 18th, passing over the Island of Cuba during the 17th.

The following special reports indicate the violent and destructive character of this storm:

Capt. Robert B. Kelly, commanding the s. s. "Ozama," makes the following report: "On the night of August 14th a hurricane passed San Domingo City, accompanied by heavy rain; barometer fell to 29.53 (750.0) at 2 a. m. of the 15th, after which the weather cleared, with rising barometer; wind set in from the n., changing to nw., w., and sw., and to se. following the passage of the disturbance." The schooner "Gertie M. Rickerson," in N. 17° 40', W. 67° 30', on the 14th, encountered a hurricane from ese. to sw., lasting six hours.

Capt. Frank Stevens, commanding the s. s. "Manhattan," reports: "August 17th, passed Alligator Reef at 4.02 p. m. bound to Havana; wind blowing strong from ene., with heavy squalls of rain and low scud flying very rapidly to the westward. A heavy, low, black, solid bank of clouds from ene. to ese., from which all the squalls and scud came, seemed to indicate that the storm-centre was there, which would put me on the lee shore, so I ran to the southwest as long as possible to get clear of the Florida reefs, and then hove-to on the star-board tack with head to the eastward. I ran until 1.52 a. m. of the 18th, when could run no longer, as the wind had increased so, and sea so high and dangerous, with barometer down to

29.36 (745.7) and falling, that I hove-to, head to the eastward; wind from e. by s. and ese., and off e. by n., blowing very hard for four hours, reaching at times seventy-five or eighty miles per hour, with a very high dangerous sea. At 4.22 a. m. the barometer commenced to rise; squalls not so frequent; sea not so high. At 9.22 a. m. kept off on our course to Havana, and noticed the heavy bank of clouds true wnw. from ne. and around to n., moving slowly in a nnw. or northerly direction; had fresh southerly winds balance of passage."

Capt. W. F. Bacon, of the barkentine "Harriett S. Jackson," at Cardenas, Cuba, on the 17th, reports as follows: "There was at this place a revolving storm beginning early in the morning, reaching its greatest force (about sixty miles) at 3 p. m., after which it moderated to a strong breeze. The gale began from ne. and backed to w. and s., blowing the hardest from nw. through to the sw. quadrant. This storm was preceded, and has been followed by, heavy northeast trades, accompanied by terrific squalls, with and without rain."

The observer at Key West, Florida, reports: "17th, day opened threatening, with brisk ne. winds; 7 a. m., barometer 29.93 (760.2), falling to 29.72 (754.9) at 3 p. m.; 12.15 p. m., squall from ne. of forty-eight miles per hour; wind continued ne. during the day, blowing in heavy gusts or squalls, and showing a tendency to back; 8 p. m., the wind hauled gradually to e., which indicated that the storm was approaching the station, and caused much apprehension; barometer continued nearly stationary at 29.68 (753.0) from 5.30 p. m. until past midnight, with numerous heavy gusts of wind, estimated at sixty miles per hour. 18th, barometer commenced to rise rapidly in the early morning, standing 29.82 (757.4) at 7 a. m.; wind slowly hauled to se., blowing in very heavy squalls; wind dropped below a gale velocity at 9.15 a. m.; weather brightening."

The s. s. "Comal," on 17th, in N. 29° 41', W. 77° 36', wind backed to ese. and se., with heavy rain squalls and easterly swell. 18th, in N. 26° 35', W. 80° 3', brisk se. wind and clear weather. The U. S. Light-house Tender "Arbutus," at Tortugas on the 17th and 18th, was in the direct track of the cyclone which passed over that position between 12 midnight and 2 a. m. of the 18th, during which time the wind attained a velocity of about seventy miles per hour. The damage caused by the cyclone in Cuba during the 17th and 18th was quite severe. The storm-centre entered Cuba near Manzanilla, crossed the island, and left it near Sagua.

6.—This was a cyclone of tropical origin, and was first reported to the eastward of the Barbadoes, under date of the 15th. Passing westward through the Caribbean Sea to about N. 14°, W. 76° by noon (Greenwich mean time) of the 19th the storm-area circled to the northwest and passed north over Cuba, in about W. 81°, during the 22d; it then moved north-eastward along the track of the Gulf Stream, and united with depression number 12 northeast of Newfoundland on the 28th. This storm was particularly severe, causing loss of life, and destroying crops and property of immense aggregate value.

The following reports illustrate its general character:

Captain Locke, of the s. s. "Muriel," from the Barbadoes, states that a severe cyclone was experienced at Saint Vincent on the 16th, doing much damage; estimated width twenty to thirty miles. It passed over the island from northeast to sw., the whole of the southern part of the island being laid waste. A number of people were killed and many injured. A steamship from Europe reported a hurricane, lasting eight hours, on the night of the 15th, ninety miles northeast of the Barbadoes.

The bark "Kestrel," in N. 12° 40', W. 69° 30', had a heavy gale, lasting four hours, during which sails were lost and split, cabin windows stove in, and cabin flooded; lowest barometer 28.90 (734.0). On the 17th a heavy gale from the west, veering to southeast, passed over Curacoa, causing much damage on the island.

Capt. T. M. MacKnight, commanding the s. s. "Claribel," makes the following report: "Laying in Morant Bay, inside reefs, August 19th, 8 a. m.; barometer 29.76 (755.9), and gradu-

ally falling. Several indications of a hurricane were absent until 11 p. m., when barometer was 29.48 (748.8), and falling; made all preparations for standing to sea, when the wind shifted from 11 p. m. of 19th to 1.50 a. m. of 20th, and increased, blowing a terrific hurricane as the centre passed to the southward; barometer at 1.30 a. m., 28.86 (733.0); 2.30 a. m., barometer 29.16 (740.7), with wind hauling rapidly to se.; 3.30 a. m., barometer 29.36 (745.7), with tremendous sea running dead on to the land. Having swung clear of the reef, with seas breaking all around the ship, weighed both anchors at once and steamed out full speed, with wind force 11; at 4.30 a. m. was well clear of broken water and stood to southward until 9 a. m., when barometer stood 29.66 (753.4), then bore away for Kingston. The red sunsets and sunrise were absent previous to this storm, as also were the feathery cirrus until the very last. The nimbus clouds were well defined and the scud flew in true horizontal lines; the cirro-stratus clouds converged at one time to the centre, but were lost as the centre approached. I calculate that the centre must have passed one hundred and twenty miles from our position, and I think the storm was one of large diameter. During the height of the storm I had two anchors down, and, steaming at full speed, did not drive at all. At commencement of storm wind set in from ne., changing to ene., e., se., and s. Lowest barometer, 28.86 (733.0), at 1.50 a. m. of the 20th; force of gale, at its height, over 12."

Captain Shackford, commanding the s. s. "Newport," reports: "Experienced a storm of unusual severity on the 19th, soon after leaving the island of Navassa. During the afternoon the sea grew rough and rain fell in torrents, while a strong wind from the northeast increased to a gale. About 6 p. m. the steamer rolled and pitched at a fearful rate. At 8 p. m. the barometer continued to fall and the vessel was headed to the eastward, away from the vortex of the storm, which by that hour had developed all the symptoms of a well-defined cyclone. The wind had increased to a hurricane and the seas were fearful. Before morning the storm-centre had passed to the westward and northward, and the ship again laid her course for Colon."

The s. s. "Alvo," Captain Williams, commanding, August 19th and 20th, at Navassa, had a heavy blow from sw. The s. s. "City of Para," Capt. Frederick Henderson, commanding, experienced a strong gale, force 9, commencing in a. m. of the 19th, and continuing until the p. m. of the 20th; wind set in from ne., backing to nw., w., sw., s., se., ese., during, and continuing easterly after the passage of the depression; lowest barometer, 29.40 (746.7), at 1.30 p. m. of the 19th, when in N. 15° 36', W. 75° 52'. A heavy ne. swell continued from the 19th to 23d. Advices from Jamaica state that during the hurricane of the 19th the entire pimento crop was blown off the trees, nearly all the coffee crop for this year destroyed, several parishes of the island denuded of trees, banana plantations destroyed, and ships in the harbor of Kingston damaged.

The s. s. "Ailsa," Capt. J. W. Sansom, commanding, had a whole gale to hurricane on the 19th and 20th; from ene. veering to sse.; lowest barometer, 29.48 (748.8), at 4 a. m. of the 20th, in N. 18° 35', W. 76° 20'. On the 23d, in N. 25° 0', W. 74° 0', had a fresh gale from se., with very confused sea; barometer oscillated between 29.72 (754.9) and 29.80 (756.9) in the space of fifteen minutes; heavy mass of clouds to the westward, and scud flying from s.; had every appearance of a hurricane to the westward travelling to northward.

August 20th a cyclone passed near Montego Bay, Jamaica. Wind set in from ene., with rain-squalls, shifting to nne., n., nw., and wsw.; lowest barometer, 29.61 (752.1), at 10 a. m.; greatest wind force from nw. from 9.30 to 10.30 a. m. On the 17th the lower clouds were moving to a cyclone north of Santiago; the upper were moving to the cyclone coming. On the 18th the cirrus from n. or ne. indicated a disturbance. This cyclone caused much injury to property and crops on the island.

A hurricane swept over the island of New Providence on the

night of the 22d. The gale was from the southeast and blew with great violence for several hours. A number of houses were blown down and many damaged. Sailing vessels dragged their anchors and went ashore or were driven over the bar and out to sea. Reports from the Berry Islands and Andros state that the storm there was very heavy, and that many sponging and fishing vessels were wrecked. Some loss of life is also reported.

The bark "Flash Light," Captain Dexter, commanding, on the 24th, in N. 34°, W. 74°, had a hurricane from se., veering to w., blowing with terrific fury; considerable damage caused to vessel. On the same date the schooner "Gertie M. Ricker-son," Captain Anderson, commanding, in N. 34°, W. 73°, took a hurricane from sse. to sw. and w., lasting eight hours. The bark "J. B. Newcombe," Capt. J. B. Newcombe, commanding, on the 24th and 25th, in N. 36°, W. 72° (at 3.30 a. m. of the 25th), had a terrific hurricane from sse. to w., lasting twenty-four hours. The bark "Mohican," Capt. B. F. Berry, commanding, in N. 37° 10', W. 71° 24' (at 6 a. m. of the 25th), had a whole gale from sse. to wsw. The s. s. "Canada," in N. 40° 28', W. 67° 12' (at 12 midnight of the 25th), had a gale from e., backing to n., with very heavy rain; lowest barometer 29.44 (747.8).

The schooner "L. A. Plummer," Capt. Ezra Howes, commanding, on the 25th, in N. 40° 50', W. 69° 10' (at 8 p. m.), had a hurricane from ene., backing to nw. The ship "Emily F. Whitney," Captain Rollins, commanding, on the 25th, in N. 39° 48', W. 69° 15' (at noon), had a hurricane from se., commencing at 10 p. m., with heavy seas; vessel shipped large quantities of water; hurricane continued on the 26th in N. 39° 29', W. 69° 51' (at noon), backing to e., ne., and nw., and moderated at 6 p. m.; barometer at noon of the 26th was 29.85 (758.2). The bark "Benj. F. Hunt, jr.," Capt. J. N. Pritchard, commanding, on the 25th, in N. 34° 22', W. 69° 48' (at noon), had a terrific gale from s., commencing at 10 p. m., and continued on the 26th, the wind shifting to w. and nw., and moderating after 4 p. m. The bark "John H. Pearson" had a heavy gale from e., backing to n. on the 25th, in N. 40° 40', W. 68° 20'.

Capt. William Cassidy, commanding the bark "Harvester," reports: "August 25th, in N. 40° 33', W. 66° 08' (at noon), at 7 p. m., strong south breeze with very heavy thunder and lightning and rain; wind shifted to se.; wore ship on starboard tack, expecting a hurricane. 26th, at 9 a. m., gale increased; wind se., with a heavy sea, also a heavy sea coming up from the wsw., and breaking; at 1 p. m. the wind increased to hurricane force, with a very heavy sea, wsw., breaking. I thought it would drive the stern in; got two oil bags over which smoothed the sea to dead swell, and which I believe was the means of saving the ship. The hurricane lasted about eight hours, gradually drawing to the westward and from there to nw. in a strong gale, decreasing in violence. The lowest barometer reached was 29.20 (741.7). The s. s. "Camellia," Captain Buck, commanding, on the 25th, in N. 39° 20', W. 69° 42', had a very strong ene. gale shifting to n., and lasting from noon until 8 p. m.; barometer 29.48 (748.8); heavy squalls of wind and rain, and heavy seas.

7.—This storm was a continuation of land depression number v. and, passing north of east over Newfoundland during the 15th, was central on the morning of the 16th in about N. 52°, W. 49°, after which it moved northeastward beyond the region of observation. This storm exhibited considerable strength and caused heavy gales south of Newfoundland during the 15th.

The following special reports have been received relative to its passage:

The s. s. "Wisconsin," on the 15th, in N. 43° 50', W. 54° 0', had a strong gale, sw., veering to nnw.; lowest barometer, 29.59 (751.6), at 4 p. m. The s. s. "England," Capt. T. P. Heeley, commanding, had a moderate gale on the 14th and 15th, wind set in from sw. and veered to nw.; lowest barometer, 29.59 (751.6), at 6 a. m. of 15th, in N. 42° 23', W. 60° 29'.

The s. s. "Wetherby," on the 15th, in N. 44° 38', W. 57° 24'

(at noon), had a moderate gale, sw., with heavy squalls and rain, veering at 11 a. m. to nw. and moderating; lowest barometer, 29.52 (749.8), at 8 p. m. The ship "Andrew Jackson," Capt. A. Emery, commanding, on the 15th, in N. 44° 21', W. 55° 51', had a hurricane from the nw.; ship badly damaged.

8.—This storm was a continuation of land depression number vi, and passed north of east over the ocean south of Nova Scotia to N. 47°, W. 52° by the morning of the 18th, during which date it moved northeast beyond the limit of reports. This storm possessed great energy and occasioned considerable damage to property and shipping in the Maritime Provinces and over the adjoining ocean.

The following special reports have been rendered:

During the night of the 16th the storm was very severe along the coast of Maine. On the night of the 18th a violent storm swept over Saint Pierre. Advices from Saint John's, Newfoundland, state that it was the fiercest gale known for a quarter of a century, great damage being caused to property and shipping. The s. s. "Holland," Capt. Wm. Tyson, commanding, on the 17th and 18th, had a whole gale from s., veering to nw. The gale was of very short duration, blowing very heavy for a few hours, accompanied by torrents of rain; lowest barometer, 29.38 (746.2), at midnight of the 17th, in N. 44° 31', W. 54° 27'.

The s. s. "Britannic," Capt. P. J. Irving, commanding, on the 18th, in N. 47° 35', W. 46° 15', had a fresh gale from s., veering to wnw., with very heavy head sea, which reduced the speed of the vessel to seven knots an hour; lowest barometer, 29.40 (746.7), at 9.30 a. m. The s. s. "La Bretagne," had a whole gale on the 18th and 19th; wind set in from s. and veered to nw.; lowest barometer, 29.41 (747.0), at 5 p. m. of 18th, in N. 49° 15', W. 41° 30'. The s. s. "Alaska," Captain Murray, commanding, on the 18th and 19th, had a fresh gale from ssw., veering to w.; lowest barometer, 29.75 (755.6), at midnight of 18th, in N. 49° 0', W. 37°, 40'. The s. s. "Borderer," on 19th, in N. 45° 50', W. 40° 31', had a fresh gale, nw.

The ship "Andrew Jackson," on the 17th, in N. 44° 4', W. 50° 15', at 10 a. m., had a hurricane, sw., moderating from s., at 3 p. m. The s. s. "Norseman," on the 17th, in N. 43° 5', W. 60° 0', had a fresh gale, beginning at noon, from se., with very heavy rain; 2 p. m., strong gale, se., heavy squalls and thunder and vivid lightning from se.; wind veered to nw. at 6 p. m. and moderated; lowest barometer, 29.99 (761.7), at noon. The s. s. "Pietre de Connick," on the 17th and 18th, had a strong gale, beginning from sse, and veering to nnw., accompanied during the morning of the 18th by terrific thunder and lightning; lowest barometer, 29.64 (752.8), at 12 noon of the 18th, in N. 44° 15', W. 50° 34'. The ship "Andrew Jackson," on the 18th, in N. 43° 20', W. 58° 55', had a hurricane from s., beginning at noon; wind veered to w. and nw. as disturbance progressed. The captain stated that his barometers misled him in judging of the probable severity of the storm on account of their great errors; he had had no chance to have them compared for nearly a year.

The s. s. "Leerdam," Capt. H. Slierendregt, commanding, on the 18th, in N. 45° 45', W. 57° 10', had a heavy storm; wind set in from se., and veered to nw.; lowest barometer, 29.59 (751.6), at 1.30 a. m. The s. s. "City of Richmond," Captain Redford, commanding, on the 18th, in N. 45° 44', W. 52° 0', at 2 a. m., had a gale, force 9; wind changed from s. to w.; greatest force when s.; lowest barometer 29.38 (746.2). The s. s. "British Princess," Capt. E. H. Freeth, commanding, on the 18th, in N. 47° 10', W. 45° 0', barometer 29.90 (759.4), had a gale of force 10, from se., veering to w.; with high sea; lowest barometer 29.69 (754.1). Capt. G. Moodie, commanding the s. s. "State of Georgia," reports: "On the afternoon of the 18th the barometer began to fall rapidly and the wind backed from sw. to s. and sse., with heavy rains; at midnight the wind had veered to sw. and increased in force; from this time to noon of the 19th the wind reached force 10, and gradually veered to westward and nw., and began to moderate; during the afternoon a wild sea was running; slowed engines;

lowest barometer, 29.48 (748.8), at 8 a. m. of the 19th, in N. 25° 35', W. 34° 31'.

9 and 10.—This storm was probably of tropical origin, but was not sufficiently well defined within the region of observation to admit of charting prior to the 20th; during this date it appeared in about N. 32°, W. 71°, and moved eastward to N. 33°, W. 62° by the 21st; it there circled northward to N. 40°, W. 65° 0' by the 22d, whence it passed north and united with number 10 south of Nova Scotia. The path of the depression was marked by disturbances of extreme violence during the 20th, 21st, and 22d.

The following special reports were made in connection with this storm and its continuation, number 10, which continued land depression number x:

The bark "Argyll," Captain Smith, commanding, on the 20th, in N. 32° 10', W. 71° 50', had a gale from s., hauling around by e. to nw., and going around the compass three times in two and one-half hours, blowing with terrific force, accompanied by vivid lightning, terrific thunder, and torrents of rain, the sea being one mass of foam, breaking in all directions; the storm passed se., leaving the ship with a hard gale from the ne. The bark "Edwin Reed," Capt. C. W. Cate, commanding, on the 21st, in N. 33° 0', W. 62° 25', encountered a hurricane from e., veering to n. to sse., which blew with especial fury for four hours, injuring two of the crew and causing considerable damage to the vessel; lowest barometer, 28.40 (721.3), at 11 a. m. The bark "Theresina," on the 21st, in N. 33° 50', W. 63° 0', had a hurricane from ese., veering to n.

The s. s. "Victoria," Capt. A. A. Kurnmann, commanding, encountered a hurricane on the 21st, in N. 34° 47', W. 62° 29'; wind set in from e., changed to n. during, and to ssw. following, the passage of the disturbance; lowest barometer, 28.45 (722.6), at midnight of 21st. The storm was accompanied by a tremendous cross sea which boarded the ship in large quantities; washing one man overboard, carrying away starboard rail and waist, and causing other damage. The s. s. "Rhynland," Capt. J. C. Jamison, commanding, had a whole gale on the 22d and 23d, from ne. backing to nw.; lowest barometer, 29.17 (740.9), at midnight of the 23d, in N. 41° 12', W. 67° 0'.

The ship "Coringa," Capt. Morris Dexter, commanding, on the 22d, in N. 40° 30', W. 67° 0', experienced a hurricane; wind ssw., changing to e. and nw.; lowest barometer at 4 p. m. The s. s. "St. Ronans," Captain Campbell, commanding, on the 22d, at 9 p. m., in N. 42° 0', W. 62° 45', had a terrific gale; wind hauled to s. and sw. at 10.30 p. m. Third Officer Inkster, observer on the s. s. "The Queen," Capt. J. Milligan, commanding, reports: "Strong gale commenced from se. at 10 a. m. of 22d and ended at midnight same date; wind veered to w.; lowest barometer, 29.60 (751.8), at 11 p. m." The s. s. "Anchoria," Capt. J. J. Small, commanding, on the 24th, in N. 42°, W. 63° (at 2 p. m.), had a fresh gale from sw. to nw.; lowest barometer, 29.79 (756.7), at 2 p. m.

The bark "Toivo," Capt. H. W. Snellman, commanding, on the 22d, in N. 41° 01', W. 66° 21' (at 3 p. m.), had a hurricane; wind set in from e. and backed to nw. The hurricane was preceded by very heavy sea from sw., and accompanied by very heavy, badly chopped sea, and torrents of rain; lowest barometer, 29.25 (742.9), at 3 p. m. The s. s. "Persian Monarch," Capt. F. Paton, commanding, on the 23d, in N. 44°, W. 62° (at 4 p. m.), had a strong gale from s., veering to nw.; lowest barometer 29.70 (754.4). The s. s. "Canada," Capt. Thos. Foot, commanding, on the 24th, in N. 42° 16', W. 61° 30', had a fresh gale from ssw., veering to nw.; lowest barometer, 29.83 (757.7), at 4 p. m.

The s. s. "Servia," Capt. H. McKay, commanding, on the 22d, had a strong gale from ne., veering to s.; lowest barometer, 29.59 (751.6), at 4 p. m., in N. 40° 44', W. 65° 15'; from 7 a. m. until 6 p. m. had constant and heavy rains, with very thick weather. First Officer Rilba, of the s. s. "Normandie," Capt. G. de Kersabiec, commanding, reports: "On the 22d, in N. 40° 45', W. 66° 20', had a hurricane from noon to 8 p. m.; wind set in from ne. and hauled slowly to sw., passing by e.,

se., and s., with force 10 to 12. The sea was monstrous and cross, coming from ene. and se. at the same time. The barometer fell to 29.02 (737.1), and rose from 8 p. m., as the wind abated. Very heavy rain fell during the hurricane."

11.—This depression first appeared on the 24th, in N. 41°, W. 67° and, moving rapidly eastward and northeastward, disappeared northwest of the British Isles during the 27th. The depression gathered strength as it moved eastward and developed considerable energy as it approached European waters.

The following are reports of vessels which came within its influence:

The s. s. "Columbia," Capt. T. Mitchell, commanding, had a strong gale from wsw. to nw. on the 25th and 26th; lowest barometer, 29.80 (756.9), at 5 p. m. of the 26th, in N. 41° 20', W. 38° 08'. The s. s. "Matthew Bedlington," Capt. T. Kirby, commanding, had a whole gale, commencing at 10 p. m. of the 26th and ending at midnight of the 27th; wind set in from ne., and veered to west; lowest barometer, 29.20 (741.7), at 3 p. m. of the 27th; position at noon of the 27th, N. 51° 46', W. 24° 34'. Chief Officer O. Griffiths, of the s. s. "Catalonia," Capt. Alex McKay, commanding, reports: "August 27th, in N. 50° 15', W. 21° 16', strong breeze at noon from s., veering to ssw., and increasing at 4 p. m. to fresh gale and high squalls; veered to w. in a. m. of 28th, in N. 50° 27', W. 27° (at noon), with heavy seas; lowest barometer, 29.42 (747.3), at 4 p. m. of 27th."

The s. s. "Normandie," on the 26th, in N. 48° 10', W. 35° 50', encountered a strong gale ene., lasting ten hours, with heavy rain and very high seas. The wind shifted to n. following the passage of the disturbance. The s. s. "Sulina," Capt. Thomas Potter, commanding, on the 26th had a storm from e. backing to nnw.; gale commenced at 3.42 a. m.; was at its height, from ne., force 11, at 11.42 a. m., with barometer 29.62 (752.3); position at 1.30 p. m., N. 45° 46', W. 37° 18'; rain during the morning. The s. s. "Australia," Capt. G. Franck, commanding, on the 26th, in N. 48° 3', W. 31° 30', had a storm commencing at noon from ne.; wind veered to ese. and backed to ene., increasing until 7 p. m., when it blew strongest from ene., with thunder and lightning; sky then cleared, with heavy squalls from ne. and n.

12.—This was a continuation of land depression number xiii, and passed north of east over the northern portion of Newfoundland during the early morning of the 28th; continuing this course it advanced rapidly to N. 54°, W. 29° by the 29th, during which date it disappeared to the northward of the region of observation. While this depression had considerable depth its track was too far north to cause violent disturbance in and south of the trans-Atlantic track.

The following special reports have been submitted relative to this storm:

The s. s. "Prussian," Capt. A. McDougall, commanding, on the 30th, had a strong gale, commencing at 1 p. m. and ending at midnight; lowest barometer, 29.45 (748.0), at 6 p. m., in N. 52° 40', W. 20° 27'. The s. s. "Catalonia," encountered a moderate gale from sw., veering to nw., on the 29th, continuing until 8 a. m. of the 30th, in N. 48° 54', W. 37° 39' (at noon); lowest barometer, 29.38 (746.2), at 8 a. m. of the 29th. The s. s. "Rhynland," Capt. J. C. Jamison, commanding, had a strong gale on the 29th and 30th, from s., veering to sw; lowest barometer, 29.21 (741.9), at 6.56 p. m. of the 30th, in N. 50° 26', W. 21° 24'.

Advices of the 31st indicated the presence of a storm of considerable energy off the eastern coast of the United States, between the thirty-fifth and forty-fifth parallels, but the regular reports at hand will not admit of accurately locating its centre.

In connection with this storm the following special reports have been received:

Capt. W. T. Bacon, commanding the bkt. "Harriet S. Jackson," reports: "31st, in N. 37° 50', W. 71° 30' (at noon). The day opened with dark, gloomy weather, and a heavy bank of clouds hanging in the sw. and south, from which portions frequently detached themselves and drifted to ne., causing heavy

showers. During the afternoon a heavy south wind set in, with torrents of rain and heavy confused sea, which conditions continued until 9.45 p. m. when there was a sudden shift of wind to north; the barometer at this time fell to 29.73 (755.1), not so much of a fall, but very unsteady, seesawing up and down, leading me to believe there was a storm-centre near by."

Chief Officer Smith, of the s. s. "Warwick," Captain James, commanding, reports having encountered a strong gale, of force 9, on the 31st; wind set in from s. and veered to n.; lowest barometer, 29.83 (757.7), at 8 a. m. of September 1st, in N. 42° 12', W. 64°. Capt. J. Raeburn, commanding the s. s. "Willesden," reports: "August 31st, in N. 33° 50', W. 75° 8' (at noon), a strong gale began in a. m. from sw., with rain, and continued through p. m.; at 8 p. m. heavy dark clouds in sw.; threatening, violent squalls passed over without increasing wind; at this time had extraordinary rip currents, the sea being tossed in foam in a remarkable manner and lashed into a confused state; these rip currents of foam seemed to move in waves from nw. to se., at 8 p. m. (about off Cape Hatteras). These rip currents of foam were, at the time, attributed to counter currents from the Gulf Stream, but now think they were caused by the earthquake in the Carolinas; 11 p. m., wind veered in violent squalls to nw., and moderated at midnight; lowest barometer, 29.53 (750.0), at 2 p. m." The s. s. "France," Captain Hadley, commanding, on the 31st, in N. 41° 57', W. 63° 50' (at 8 p. m.), had a storm, of force 11, from s., veering to north; lowest barometer, 29.82 (757.4), in position above cited.

OCEAN ICE.

On chart i are also exhibited the eastern and southern limits of the region within which icebergs and field ice have been reported during August, 1886. These limits have been determined from reports furnished by shipmasters, and from trustworthy data published in the "New York Maritime Register" and other newspapers.

During this month the easternmost ice was encountered on the 6th, in N. 50°, W. 48°, and the southernmost ice reported was observed in N. 48° 35', W. 48° 46', on the 4th; in each instance the icebergs were isolated. In the Strait of Belle Isle, and eastward in the track of trans-Atlantic vessels to the fifty-second meridian, icebergs were encountered during the first half of the month, but one report, for the 25th, showing ice in that locality after the 14th. Although ice is not commonly encountered in quantities in the trans-Atlantic tracks during August, the area within which it appeared during August of the present year was unusually small. In this connection it is also of interest to note that vessel reports show that the water temperature was appreciably higher than the average for August.

A comparison with the chart for the preceding month (July, 1886), shows the number of icebergs to be largely diminished, and the area within which they were observed to be greatly contracted to the northward and westward. In July they were most numerous to the eastward of Newfoundland, between the forty-eighth and forty-ninth parallels, while during the present month they were not encountered in numbers south of the fifty-second parallel nor east of the fifty-second meridian.

The following table shows the comparison between August, 1886, and the four preceding years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
August, 1882.....	46 50	46 00	August, 1882.....	46 50	46 00
August, 1883.....	43 26	51 41	August, 1883.....	48 00	44 00
August, 1884.....	43 24	48 44	August, 1884.....	47 50	43 50
August, 1885.....	43 48	52 04	August, 1885.....	48 03	42 45
August, 1886.....	48 35	48 46	August, 1886.....	50 00	48 00

Icebergs were reported during the month, as follows:

4th.—The s. s. "La Champagne," in N. 48° 35', W. 48° 46', passed a small iceberg.

6th.—A large iceberg was observed in N. 50°, W. 48°.

9th.—The s. s. "Montreal" passed several icebergs in the Strait of Belle Isle, a few outside, but none east of the fifty-second meridian.

12th.—The s. s. "Circassian," in N. 52° 34', W. 53° 40', passed an iceberg. The s. s. "Ontario," in N. 52° 8', W. 51° 53', passed a large iceberg; passed several large bergs in Belle Isle Strait, as far west as Greenly Island; saw the easternmost iceberg one hundred and thirty miles east of Belle Isle.

13th.—The s. s. "Buenos Ayrean" passed one iceberg in N. 52° 22', W. 53° 13'; one in N. 52° 12', W. 53° 56'; two twelve miles southeast off Belle Isle; five in the Strait of Belle Isle; and one three miles off Point Amour, in the track of ships. The s. s. "Circassian" passed several icebergs between Belle Isle and Cape Norman, and three icebergs off Point Amour.

14th.—An iceberg observed in N. 52° 14', W. 53° 40'.

25th.—The s. s. "Norwegian" passed three icebergs near Belle Isle.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during August, 1886, seven reports concerning storms and icebergs encountered by vessels in the Atlantic west of the forty-fifth meridian.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for August, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. On chart iv the departures from the normal temperature are illustrated by lines connecting stations of normal or equal abnormal values.

By chart iv it will be seen that the August, 1886, temperature corresponds in some respects with the mean temperature for July, the temperature for both months being below the normal over all parts of the country lying east of the Mississippi River, and above, from the Mississippi westward to the Pacific Ocean. During the month the largest departures in excess of the normal occur in the Missouri and upper Mississippi valleys, especially in Iowa, northern Minnesota and Dakota, and Montana. Although the western part of the country is above the normal generally, several exceptions are noted, viz., Sacramento and San Francisco, California; Fort Verde and Yuma, Arizona; Santa Fé, New Mexico; these stations are about normal or slightly below. With a few exceptions the mean temperature has been below the normal at all stations lying east of the Mississippi River, the largest departures occurring along the coast of the middle Atlantic states, where they averaged about 2°.0.

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.		Below normal.	
	o		o
Des Moines, Iowa.....	4.3	Portland, Maine.....	3.0
Fort Davis, Texas.....	3.8	Oswego, New York.....	2.9
Fort Shaw, Montana.....	3.6	Norfolk, Virginia.....	2.6
Saint Louis, Missouri.....	3.3	Nashville, Tennessee.....	2.5
Fort Elliott, Texas.....	3.2	Cape Henry, Virginia.....	2.2
Fort Sill, Indian Territory.....	3.2	Rochester, New York.....	2.1
Fort Thomas, Arizona.....	3.1	New Haven, Connecticut.....	2.0
Fort Maginnis, Montana.....	3.0	Augusta, Georgia.....	2.0

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature, are given in the table of miscellaneous meteorological data.

The following are some of the greatest and least monthly ranges at Signal Service stations:

Greatest.		Least.	
	°		°
Fort Totten, Dakota.....	73.8	Fort Canby, Washington Territory	14.7
Fort Yates, Dakota.....	72.5	Tatoosh Island, Washington Ter.....	18.6
Bismarck, Dakota.....	70.5	Cape Hatteras, North Carolina	18.8
Saint Vincent, Minnesota.....	70.2	San Diego, California.....	21.1
Fort Buford, Dakota.....	69.4	Fort Macon, North Carolina.....	21.6
Poplar River, Montana.....	68.4	Galveston, Texas.....	23.1
Moorhead, Minnesota.....	68.2	Pensacola, Florida.....	25.3
Fort Custer, Montana.....	67.9	Block Island, Rhode Island.....	25.5

Table of comparative maximum and minimum temperatures for August.

State or Territory.	Station.	For 1886.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
Alabama.....	Mobile.....	97.0	67.4	100.0	1874	63.0	1884
Do.....	Montgomery.....	97.8	60.4	103.0	1874	61.5	1879
Arizona.....	Prescott.....	92.8	55.5	92.0	1878	38.0	1876
Do.....	Fort Apache.....	97.0	53.3	98.1	1885	41.0	1880
Arkansas.....	Fort Smith.....	104.5	57.1	103.7	1884	57.1	1885
Do.....	Little Rock.....	102.0	57.1	102.0	1881	59.2	1884
California.....	San Francisco.....	84.6	48.4	89.0	1879	50.0	'75, '79, '82
Do.....	San Diego.....	82.5	61.4	91.5	1884	54.0	1879, 1884
Colorado.....	Denver.....	94.3	48.5	105.0	1878	44.0	1876
Do.....	Pike's Peak.....	51.2	29.0	62.0	1878	15.0	1882
Connecticut.....	New Haven.....	85.6	47.8	90.0	'73, '76, '81, '84	45.1	1885
Do.....	New London.....	83.7	49.8	90.0	1873	47.5	1884
Dakota.....	Fort Buford.....	103.9	34.5	107.0	1882	30.0	1884
Do.....	Yankton.....	99.1	40.7	103.0	1873	45.0	1876
Delaware.....	Del. Breakwater.....	93.0	53.0	93.0	1881	60.0	1881
District of Columbia.....	Washington City.....	92.0	55.8	101.0	1881	50.0	1874
Florida.....	Jacksonville.....	93.8	64.9	100.0	1874	66.0	1874, 1875
Do.....	Key West.....	100.0	73.1	95.4	1881	72.0	1882, 1884
Georgia.....	Atlanta.....	94.0	62.0	96.2	1881	57.0	1879
Do.....	Savannah.....	93.2	65.8	100.0	1878	63.0	1879
Idaho.....	Boise City.....	97.5	48.5	103.0	1879	39.0	1881
Illinois.....	Chicago.....	97.0	57.8	103.0	1881	54.5	1885
Do.....	Chicago.....	91.6	53.0	98.0	1874	47.0	1882
Indiana.....	Indianapolis.....	92.2	53.0	101.0	1881	47.7	1885
Indian Territory.....	Fort Sill.....	104.0	62.0	105.0	1881	53.0	1880
Iowa.....	Dubuque.....	97.4	45.5	97.3	1881	41.0	1875
Do.....	Keokuk.....	99.1	53.4	102.0	1873	47.0	1875
Kansas.....	Dodge City.....	105.8	52.2	107.0	1874	50.0	1884
Do.....	Leavenworth.....	105.8	52.2	107.0	1874	50.0	1884
Kentucky.....	Louisville.....	94.5	59.1	104.6	1881	52.4	1885
Louisiana.....	New Orleans.....	94.7	67.8	96.5	1877	69.0	1879
Do.....	Shreveport.....	101.0	63.8	105.0	1881	58.0	1880
Maine.....	Eastport.....	81.6	47.0	88.0	1880	45.0	1880
Do.....	Portland.....	87.0	49.3	95.0	1876	47.5	1885
Maryland.....	Baltimore.....	92.0	58.1	98.0	1881	52.0	1874
Massachusetts.....	Boston.....	90.4	49.3	96.8	1881	47.0	1880
Michigan.....	Detroit.....	89.3	51.5	98.8	1881	45.0	1875
Do.....	Alpena.....	90.3	44.0	92.0	1878	39.0	1884
Minnesota.....	Duluth.....	92.1	40.5	93.0	1881	43.8	1885
Do.....	Saint Paul.....	94.2	42.1	98.0	1880	43.0	1875
Mississippi.....	Vicksburg.....	96.3	66.1	100.0	1878	61.8	1885
Missouri.....	Saint Louis.....	102.0	61.0	106.4	1881	53.5	1885
Montana.....	Fort Benton.....	100.0	37.9	108.0	1881	34.0	1881
Do.....	Helena.....	95.1	47.6	95.0	1880	34.0	1880
Nebraska.....	North Platte.....	99.2	44.7	103.0	1878	42.0	1876
Do.....	Omaha.....	99.0	43.6	105.0	1874	49.0	1877
Nevada.....	Winnemucca.....	90.7	42.8	102.5	1882	32.0	1880
New Hampshire.....	Mount Washington.....	88.9	28.3	74.0	1872	20.0	1876
New Jersey.....	Atlantic City.....	86.5	55.3	91.8	1881	48.8	1885
Do.....	Sandy Hook.....	89.2	79.1	96.2	1881	54.9	1885
New Mexico.....	Santa Fé.....	80.0	51.0	97.0	1878	49.0	1882
New York.....	Buffalo.....	86.2	47.2	90.8	1881	44.0	1880
Do.....	New York City.....	87.7	57.8	96.0	1881	51.0	1885
North Carolina.....	Charlotte.....	91.9	56.4	100.5	1881	55.8	1885
Do.....	Wilmington.....	92.8	60.2	99.0	1878	50.0	1874
Ohio.....	Cincinnati.....	90.8	56.9	101.0	1881	50.9	1885
Do.....	Cleveland.....	89.5	51.0	98.7	1881	45.6	1876, 1885
Oregon.....	Portland.....	89.6	48.2	94.5	1885	43.0	1876
Do.....	Roseburg.....	93.8	46.1	97.2	1884	40.0	1882
Pennsylvania.....	Pittsburg.....	92.6	51.8	99.8	1881	47.4	1885
Do.....	Philadelphia.....	91.8	56.1	99.0	1881	51.1	1885
Rhode Island.....	Block Island.....	80.0	54.5	82.0	1882	52.9	1885
South Carolina.....	Charleston.....	92.0	66.2	97.5	1881	62.0	1879
Tennessee.....	Knoxville.....	93.2	58.2	100.0	1881	50.0	1879
Do.....	Nashville.....	97.7	57.7	104.0	1874	54.7	1883
Texas.....	Fort Davis.....	96.0	58.9	100.0	1884	47.0	1882
Do.....	Galveston.....	94.4	71.3	98.5	1874	70.0	'77, '80, '82
Utah.....	Salt Lake City.....	99.1	55.2	101.0	1875	44.0	1880
Virginia.....	Lynchburg.....	91.8	57.3	100.0	1881	50.0	1874
Do.....	Norfolk.....	92.8	64.4	99.0	1881	58.0	1874
Washington Ter.....	Spokane Falls.....	95.6	45.5	101.5	1882	38.0	1881, 1882
Do.....	Olympia.....	86.0	44.6	92.2	1885	41.0	1880, 1882
Wisconsin.....	La Crosse.....	91.3	48.8	98.0	1874	43.8	1885
Do.....	Milwaukee.....	92.7	47.8	98.0	1874	42.0	1875
Wyoming.....	Cheyenne.....	96.1	56.1	100.0	1882	34.0	1876

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for